Association for Information Systems
AIS Electronic Library (AISeL)

CONF-IRM 2009 Proceedings

International Conference on Information Resources Management (CONF-IRM)

5-2009

CRAS Model: A Model for Representing Information Space in a Multimedia Environment for Information Sharing and Reuse

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52. CRAS MODEL: A MODEL FOR REPRESENTING INFORMATION SPACE IN A MULTIMEDIA ENVIRONMENT FOR INFORMATION SHARING AND REUSE

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Abstract

The objective of the work was to propose a specification for accessing information in an information bearing objects (document) in a multimedia environment for its reuse. The model is associated to information system development. Forging this specification of information access is expected to provide a base for programmable methodology for computer programmer in accessing a wide range of information in a consistent manner. For example, it was conceived to provide a base to address an information space with specific parameters. It is meant to provide methodology of programming such as events, methods and properties for such space. The conception is meant not only to create associated programming methodology but storage standards emanating from multimedia documents. The work identified four parameters of information bearing objects: Content, Reference, Annotation and Support. These parameters were used to propose methodology of information representation associated to specific domain. The detailed parameters were explained with examples and prototype.

1. Introduction

It is difficult to differentiate between data and information. Most definition of information assumed that information "is a processed" data. Other view of information is the fact that, it is the possession of a decision maker that makes it possible for him to make guided decision. The question that is often neglected is when, where, how can we say that a data has been processed bearing in mind the language of presentation, other circumstances surrounding the presented information and other the peculiarities of the information audience? The attempt in this work is to redefine information in line with the environment of information and the place of the information user. It was assumed that information should be defined integrally from the perspective of the user (usage) and from the perspective of the analyst (information generation).

2. Related work

In a related work (Dourish and Chalmers, 1994), attention is given to the organization of online information space to assist in navigation. It justified the necessity of spatial information organization by comparing its to the importance of spatial organization proposed by architects. In another development, (Normore and Bendig, 2001) proposed a systematic classification system hinged on multidimensional information space in which words/concepts are arrayed. The essence of this was to create space to place information items in order to establish relationships among items. The (CCSDS, 2002), Reference Model for an Open Archival Information System (OAIS)

information model is no doubt a detail information model. The problem with it is the complicity and the requirements in adapting it to specific use (particularly in personal use). In the case of Dublin core detailed in (Hillmann, 2005), the audience was more for document creation. The content of information was not given expected attention. It also emphasized information creation without necessary reference to personal interpretations from the users. In the case of Dublin Core, its assumed a document can be viewed with fifteen different areas (Contributor, Coverage, Creator, Date, Descriptions, Format, Identifier, Language, Publisher, Relation (Related Resources), Rights, Source (resource that gave birth to the source), Subject, Title and Type). Though these are relatively good place to begin understanding document composition, reference is not made to how it is being perceived by a user.

The National Gallery of the Spoken Word (NGSW) attempted to organized on-line repository of spoken word collections.

3. CRAS model

The work defined an information space as an environment or an object containing accessible and comprehensible information. It may be described as :

$$Sx \rightarrow F(CRAS)$$

The type of information, the quality of information, and factors surrounding information comprehension is not a subject of the work. An information space *Sx* (information bearing source) can be reference in time and space with events and actors. It was divided into four layers. (a) Content layer (b) Reference layer (c) Annotation layer (d) Support layer. Each layer has its properties, accessing method and associated method of interaction. The associated method of interaction in each layer is dependent on the reference layer. Reference layer itself is self dependent.

Reference (Network, source, focus, parameters of reference)
Content (title, descriptors, author, date created, date accessed, domain of reference,)
Support (information type, media support type, coding language, lifespan)
Annotation (…)

An information space can be represented with select domains. Each domain is characterized with CRAS. It is not possible to have all domain represented. It is only possible to identify a domain of interest.

$$\sum_{1}^{n} CRAS$$

An information space is a container of information (content). An information space must transmit information through a channel (support). It should be possible to reference information space by the method of access and its relationship to other information spaces (reference). When information is accessed, it is primarily for use. The use may be immediate or for future use. The use can be personal of for public. When information space is accessed, the user directly or indirectly classifies the accessed information (annotation).

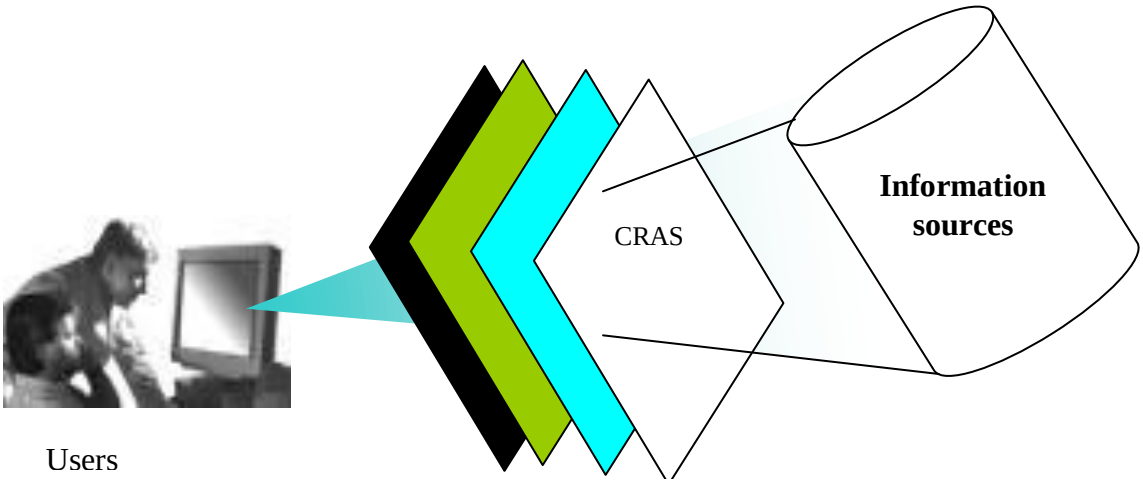

Figure 1: An overview of CRAS Model

3.1. Content layer

It was believed that an information bearing object (document) is a container of information. A document is expected to transmit information. The transmission and reception of message in a document demands different consideration. The assumption is that most objects that referred to as document have integrated constituent. A multimedia document can be defined as any document having one or more of the following constituent in isolation or in integrated form. An information source can contain text, sound or image. In the table below, these forms of we give example

The idea is that all multimedia information sources can be identified using one of the category in the table. The word multimedia means "more than one", but in this case, information source with typically just one of the three characteristics was included. This is because; it was assumed that the word text, image and sound needed a further clarification that is beyond the considerations here. Definition of image for instance is subjective. If some artistic writings are presented, are they to be called text or text and image? How can image, text or sound be defined? The frontiers of separation between all these attributes of an object remain unclear.

Table 1: Table of type of document sources

	Text	**Sound**	**Image**	**Example**
1			X	Paints
2		X		Music
3		X	X	Video
4	X			Book
5	X		X	Commented image
6	X	X		Advertisement
7	X	X	X	Commented Video

An attempt was not made on animated images because this will involve the mathematics of expressing the location. Any information space exist in a three dimensional place (x,y,z) at any time. Animated videos are reconstitution of an information space with respect to two or more different times.

3.2. Reference layer

The term "reference" was used in a specific way as what is required to access content of information.

A reference to information is the pathway of accessing specific elements in a document. The specific elements may be the dominant character or another identifiable character. Identification of dominant character was done using structural constituents of documents. Referencing information space can be done using two methods: access reference and relative reference. Two types of references were identified:

Access reference: (network parameters, technology, resources)
Relative reference (location, time, context)

3.2.1. Access

Network parameters are parameters that can be used to relate the sets of information spaces in an entire multimedia document. A space in a multimedia document must have some specific access parameters. In access reference, the questions that must be answered include: What is the place of an information space in the entire document? For example, a set of information spaces may be introducing other information spaces. It may be summarizing other set of information spaces. Another question is, what relative role is a set of information space (possibly a scene) playing? What is the implication of removing or altering the set of information spaces?

Technology and resources are needed most of the time to access a series of information spaces. This work considered the technological and physical resources needed to access a set of information spaces. Resources might be money or specific tools.

3.2.2. Relative

It was assumed no multimedia document may be considered in isolation. They can be considered to be view as in existence in relationship to other document in history and time. Since documents are supposed to contain information, the information must be located relative to media containing them.

3.3. Adaptive layer

There can not be information in a document without a personal interpretation (view) to the document. Whenever there is information conveyed by an author of a document, the view of the author is not necessarily the view of the user of that information. Unconsciously, every user is directly adding a layer of information on the existing information. This layer is essentially adaptive to his own personality independent of the original author. This work called this layer of interpretation by a user "an annotation". An annotation may be skewed by external compromises and dictates (as in indexation) or it may be left to the discretion of document user. An annotation

may be made available to other users of the same document or to the privacy of the document users.

This work is of the view that annotation takes care of anything that has to do with the view of the user. Whenever and information source is accessed, the user is bound to classify the information. The classification itself is an annotation on the information source. He is classing it by domain and context. It is interesting to note that, though the time of consultation is hardly invoked, this work consider time as an important factor in annotation.

The issue of annotation is seen from two perspectives and two levels. Annotation is an action as well as an object. The level of annotation is beyond the simple classification of information space to its use for summarizing, interpreting, questioning, making remarks on information space.

Assuming that

- An annotation may not be created by two persons on an information bearing source.
- Two or more person may create different annotations on same information source
- A document may have more than one annotation which is independent of other annotations on other sources that are in reference to the same information source.

An annotation is represented as a function of domain of reference, host document, its creator, context and time.

$$\Delta \in f(\text{ domain, user, information source, context, time})$$

An annotation on a document may share two or more domain in common with another annotation on another document. It was assumed that an annotation may belong to several domains depending on the point of reference. Not more than three domains is of importance for any point of reference. A creator of annotation is expected to make his annotations based on his experiences and a domain of reference. The concerned is on three types of experiences. The author of a document may not influence the annotations made on his documents.

3.4. Support layer

The Open Archival Information System (OAIS) was an attempt to provide a model for an archive consisting of an organization of systems and people that involved in preserving information and its dissemination (CCSDS, 2002) (Cirocchi et al,, 2000). These works gives description of the repository of information archive.

Information space from the perspective of their support (container) can be viewed from two broad realms. Information may be hosted on a visible object or intangible object. It may be hosted in an analogue device or in a digital device. The concern of this work is not to detail the specific characteristics of the object hosting information but to give a general description. It suffice to describe an information media as:

<media>
<name> </name>

<description> </description>
<peculiarity> </peculiarity>
</media>

3.5. CRAS representation

CRAS model can be summarized with the following mathematical equation:

$$\eta i = \sum C(t_x i_y s_z) \bullet R(\alpha, r) \bullet \Delta(\delta_k u_k X_k \Omega t_k \tau_k) \bullet S(N, D, P)$$

where

$C(t_x i_y s_z)$ is the content in a specific information space typically in terms of text (0,1), image (0,1) and sound (0,1)

$R(\alpha, r)$ is the reference to the information space

$(\delta_k u_k X_k \Omega t_k \tau_k)$ is the parameter related to user's adaptation expressing user's domain, context, information source reference and the time of access

$S(N, D, P)$ is the support for media of the information space.

An XML-style of representation of this model was created with four sections and details of each of the section.

4. Conclusions and perspectives

This work represented information space using four selected criteria of content, reference, annotation and support. The essence was to look at information space from the perspective of its significance and access by a user.

Last part of this work was the creation of XML-style standard for information space representation called (crasXML). The standard was meant to facilitate information representation portability across medium, devices and make room for information reuse. It was also to provide access to specific section of information.

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